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ABSTRACT

Multimedia techniques allow one to present information using text, video, animations, and sound. "Infotech Interactive" is a CD-ROM multimedia product developed to enhance an introductory computing concepts course. The software includes the following module topics: (1) "Mouse Basics"; (2) "Data into Information"; (3) "Applications Software"; (4) "User Interfaces"; (5) "Processors"; (6) "Secondary Storage"; (7) "Peripheral Devices"; (8) "Multimedia"; (9) "Data Representation"; (10) "Networks"; (11) "The Internet"; (12) "Querying a Database"; (13) "Client/Server"; (14) "Encryption/Decryption"; (15) "Security"; and (16) "Backing Up Data." The formats used are discussed and two topic modules are described in more depth. The greatest challenge in developing this software was to determine how to increase the level and modes of interactivity to actively engage students. This paper also discusses how the various conceptual modules provide meaningful user interactivity, and provides a summary of preliminary reviews of the software and possible improvements. (Author/SWC)

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Infotech Interactive: Increasing Student Participation using Multimedia

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Abstract

Multimedia techniques allow one to present information using text, video, animations, and sound. Infotech Interactive is a multimedia product developed to enhance a computing concepts course. This paper lists the topics explored in this software. The formats used are discussed and several topic modules are described in more depth.

The greatest challenge in developing this software was to determine how to increase the level and modes of interactively to actively engage students. This paper discusses how we provide meaningful user interactivity with various conceptual modules. In conclusion we give a summary of preliminary reviews and discuss possible improvements.

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Infotech Interactive: Increasing Student Participation using Multimedia

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Abstract

Multimedia techniques allow one to present a body of information using text, video, animations, and sound. Infotech Interactive[1] is a multimedia product developed to enhance a general computing concepts course. This paper gives the set of topics explored in this software. The general formats used in the several modules are discussed and several specific topic modules are described in more depth.

The greatest challenge in developing this software was to determine how to increase the level and modes of interactively so as to actively engage the students. This paper discusses how we provide meaningful user interactivity with the various conceptual modules. In conclusion we give a brief summary of the preliminary reviews which academic users have provided and discuss possible improvements.

Introduction

In late Fall of 1994 Richard D. Irwin, Inc., The Human Element, Inc.[2], and I started work on an ill-defined project to "develop an interactive CD-Rom" to accompany a textbook[3] for a computer concepts course. Richard D. Irwin, through Bill Bayer and Tom Casson, provided the funding and editorial review. The Human Element, through Adam Burton and a large support cast of artists and technicians, supplied graphics and implemented the modules. I supplied the textual material and we all defined the functionality of the modules. This paper describes the goals and design issues addressed in the project, highlights several of the modules, discusses the different types of interactivity used, and summarizes some of the initial response to this educational software.

Project Goals and Design Issues

We identified a collection of goals for this software.

- *The audience was to be students in an introductory computer concepts course.*

This mandated that the material be presented in a non-technical manner at a relatively introductory level. A fair characterization of the material is that it stresses *what* users employ computing tools for and *what* they are useful for more than showing the details of *how* they are implemented. As is seen by the topic list shown later in the paper, we selected mostly non-technical topics. Where detailed technical issues were involved we have attempted to address them in a conceptual manner not a technical manner.

- *The software was to accompany a text book but should be independent of a specific text.*

Although this is currently being distributed with a text[3]. the material is not dependent on that text for any specifics. Since we assume that students will have a text available we decided to keep the textual material to a minimum. With few exceptions all text is included directly on the screen with no paging or scrolling. A particular modules is not a complete treatment of a topic. They are designed to give the user the opportunity to manipulate some of the concepts and ideas in each of these different areas.

- *Some additional information about terms used in the text was to be available.*

As textual material was to be kept short, there was not screen space available to completely define all terms used. Initial feedback by external reviewers indicated that this was a weakness. Thus, a glossary is provided to allow users to obtain ready definitions of terms. We incorporated the glossary from the

Williams[3] text and supplemented it with all additional terms used in the CD-Rom.

- *The program is to present a simple, yet flexible user interface.*

In order to allow users maximum flexibility we decided to offer perpetual navigation. Users can select any module at any time. A typical screen layout is shown below. The modules are selected via the menu at the left. The introductory section of a module is entered when it is selected. Additional information when available is indicated by a red "I" or a yellow "INFO" button. A prompt bar gives instructions about what is expected next and is context sensitive. The glossary can be invoked at any time.

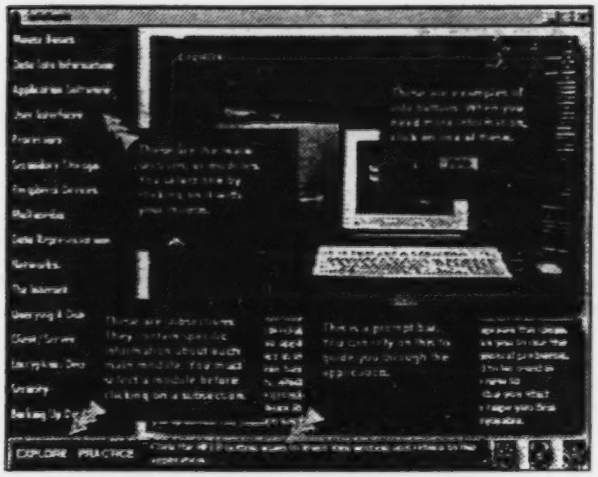

Fig. 1 - General Screen Layout

- *All modules will use a consistent learning model.*

All modules (excepting the Mouse Basics Module) consist of three sections. The **Introduction** introduces the module and defines any needed terms. For some modules this is relatively brief. For others, such as the peripheral devices or data representations nodules, this is extensive detailing a user-level view of the topic. The **Explore** section, typically, contains the most interaction. In this section users are allowed to manipulate the ideas that were presented in the introduction. Students are permitted to interact with the ideas at their own pace until they feel confident enough to be quizzed on the material. The **Practice** section is used for assessment. Users are presented scenarios in which they must use the ideas seen in the previous sections to solve a small problem or determine a correct answer. We will discuss several specific examples later.

- *The product should engage the users through meaningful interactions.*

This was one of our major design issues. Where and how should we interact with the users. Some places were obvious, we had to have selectable menus, information buttons, and page turning mechanisms. The Exploration and Practice sections received the most attention.

In the exploration section we developed a number of scenarios in which users could explore issues in an unstructured manner, jumping from topic to topic at their discretion. Many topics allow users to select parameters and see the effect of their choices immediately.

The practice sections also make extensive use of similar interactivity. Most questions are in the form of "what software tools would you use to ...", or "select the appropriate parameters to best ...", or "what format would be best to describe ...." We ask questions for which there is usually not one correct answer. This allows us to conduct a dialog with the user as he refines his answer investigating strengths and weaknesses of different aspects of the answer. We have found that users will intentionally give incorrect answers just to see the interaction.

Module Topics

We initially identified 25-30 possible modules. Budget and time constrains reduced that number to 16 which were actually developed. They were:

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1. Mouse Basics - *introduction to using Windows and a mouse.*
2. Data into Information - *data presentation; a collection of different charts and reports.*
3. Applications Software - *a survey of popular types of software including: spreadsheets, word-processing, databases, communications, and others.*
4. User Interfaces - *a tour of command line, menu-driven , and graphical user interfaces.*
5. Processors - *a quick look at data and instruction storage and the basic instruction cycle.*
6. Secondary Storage - *disk characteristics, directories, and file storage.*
7. Peripheral Devices - *a look at what different devices do, how they are used, and how they work.*
8. Multimedia - *what it is and how it is used.*
9. Data Representation - *how elementary data items, simple data structures, and databases are represented in a typical computer system.*
10. Networks - *characteristics and types of networks.*
11. The Internet - *what it is, how it works, and how to find information using a browser.*
12. Querying a Database - *using a relational database and extracting data from tables.*
13. Client/Server - *what it is and comparing file servers with database servers.*
14. Encryption/Decryption - *data security through simple encodings.*
15. Security - *a scavenger hunt for security flaws and a look at tools to increase computer security.*
16. Backing Up Data - *construct a backup plan using incremental/and full backups to a set of tapes*

Sample Modules

In order to illustrate the flavor of these modules we will discuss the Querying a Database and the Data Representation modules in more detail. Querying a Database module is a good example of the flexibility designed into the Explore section. Shown below, in Fig. 2, is one of the exploration screens in which the user can formulate queries by selecting criteria based on GPA and Major. Once a criterion is selected those items which would be selected using that criterion are highlighted in the table. Illogical criteria, such as all students who have a major of "CS" and a major of "Econ" a student can not have two majors. Similarly, selecting both "GPA≥3.0" and "GPA≥3.5" will give feedback indicating that this selection is equivalent to just the simpler criteria "GPA≥3.5".

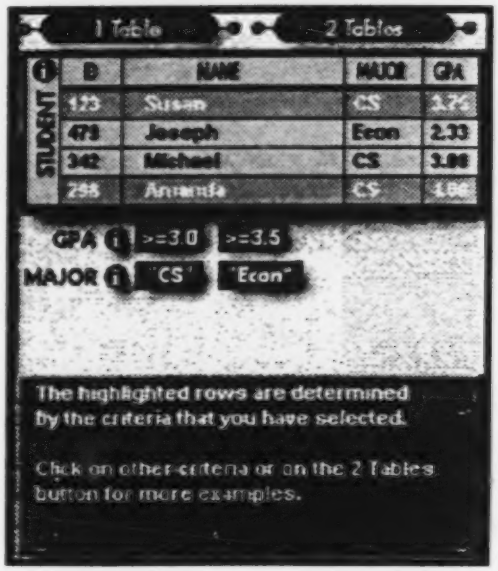

Fig. 2 - Querying a Database - Explore - 1 Table

Since queries on a single table are somewhat simplistic we introduce a second table of courses and grades. This addition raised a technical question; namely, how do we discuss the database join operation. We could have discussed Cartesian products, natural joins, equi-joins, inner joins, and outer joins with the predictable result of totally confusing the intended audience. We chose to concentrate of the portion of the problem that would be visible to a naive database user using a commercial software product which would require that the user specify the join condition. Fig. 3 shows as a query to obtain all "CS" majors having a "GPA≥3.0" with courses in which they received a

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grade of "B." The users select the criteria and then select the Execute button to invokes a query and shows the results at the bottom.

The "Join by ID" selection toggles between a Cartesian cross product and an equijoin of the two tables. We don't burden the users with these technical terms, but rather allow them to manipulate the data and discover their characteristics informally.

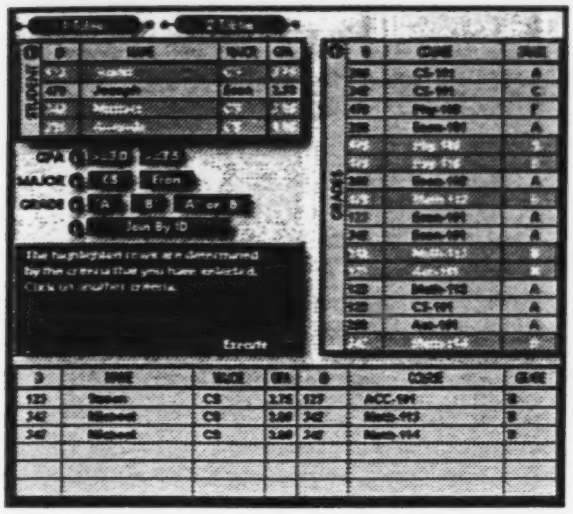

Fig. 3 - Querying a Database - Explore - 2 Tables

The Practice portion of the Querying a Database module requires that students use these same tables to formulate queries which will answer specific information needs. For example, one of the questions is: "The College of Business and Economics wants a list of all 'Econ' students names and course in which they received either an 'A' or a 'B'." Wrong responses result in gentle warnings and hints. The correct response results in a Bravo!

Here, and in most other modules, there are often several answers which will suffice to correctly answer a question. In the query above one could return the name, course, and GPA for Econ students with A or B. This correctly answers the question and the student needs to know that. The response, as seen below in Fig. 4, would tell them that additional, unrequested, data is being returned but that it is essentially a correct answer. Were the selection criterion incorrect the feedback would indicate that the solution was incorrect.

We have also used the practice section to introduce some additional information. Again using the Database module as an example the users are instructed to select only certain columns for their results (the database projection operation). A syntactically correct SQL language query is generated and displayed as they select the criteria to be used in formulating their answer. This hopefully, gives the readers some exposure to the topic of query languages without requiring them to become mired in the details of learning a computer language.

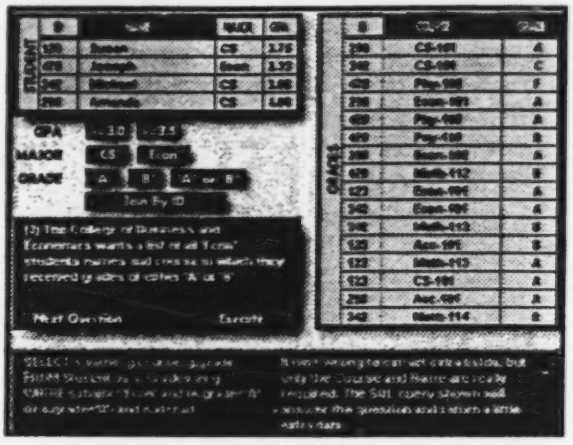

Fig. 4 - Querying a Database - Practice

The Data Representation module shows how different data types are used and how they are represented. We show Boolean data, characters, integers, real numbers, records, hierarchical databases, networked databases, and relational databases. The Introduction discussed and illustrates how a casual user would use each of these. The Explore section shows how each would be represented; namely, bits and bytes for the elementary data items and structures for the more complex items. This is accomplished through a combination of animations and user selections or input with the feedback being how that particular item is represented.

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The Practice section became a challenge. We wanted to insure that the users could determine how a particular object was represented or what an object represents. We did **not** want, however, to require that the user be very proficient. We had originally decided to avoid the traditional multiple choice question, but it seemed an obvious choice for questions of this type. This became an opportunity to make even the ubiquitous multiple choice question can more interesting with interactivity. We ask questions in this format which it are really unreasonable for the students to be able to answer given the level of their involvement with computing. For example, as seen below in Fig. 5, is a question that asks them to give the internal representation of the decimal integer 51. Initially there is a relatively meaningless graphic on the screen along with the question. If they determine that they need assistance with the details of a question they can select the "Help Me" button. This causes the appropriate Explore section to be invoked which then can be used to extract the needed details. For the question shown here they can press the red buttons until they determine the correct answer.

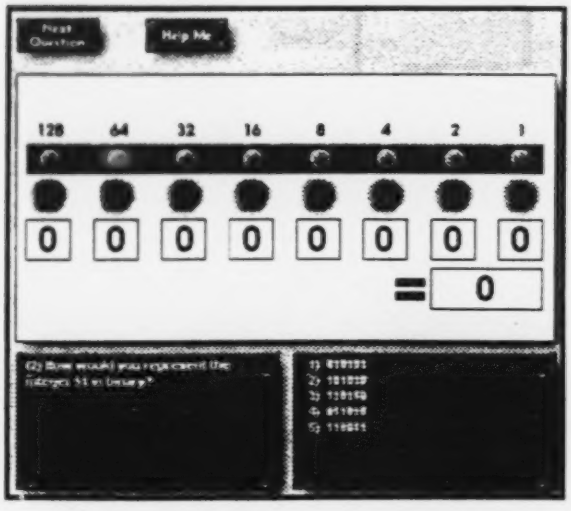

Fig. 5 - Data representation - Practice

User Interactivity

We believed that the manners in which users interacted with this software was critical. Multimedia material without user interactions will not engage the user. We purposefully varied the types of interactions between pointing to icons or objects, dragging icons, and entering text from the keyboard.

We also have made extensive use of animations to illustrate concepts. Where possible we have allowed user input drive the details of the animations. For example, in the Networks module the users configure the network and the configuration dictates the animation. In the secondary storage module the user selects where on a disk drive data is to be stored and the animation moves the disk and arm accordingly.

We have used sound and video to a lesser extent.

Conclusions

Infotech Interactive has been distributed since the summer of 1995 and we have conducted an extensive post-production review of the product. As with any review the results were not unanimous; but several themes were evident.

- *more interactions*

The interactivity was well received and its variety was noted. A common theme was the desire to increase the amount of interactivity. Where we allowed several paths through a module the reviewers asked for dozens. Where we had a small number of practice questions, more were desired.

- *more glitz*

In developing Infotech Interactive we had purposefully avoided the gratuitous use of gaudy colors, audio feedback, and flip user feedback. The

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reviewers indicated that we were too conservative in our use color, sound, and text.

- *less text, cleaner text, more text*

Here we got mixed responses. Many of the reviewers felt that the text was too sketchy and that we should include a complete, text-like, discussion of each topic. This group wanted the CD to be a substitute for a text. A similar number of reviewers felt that we should reduce the amount of text even further and make more of it optional. A common complaint was that the text was somewhat hard to read and would be better were it presented in a web-like text browsing window separated from the interactivity screen. This would give users the ability to resize text windows and select any desired font.

- *more audio and voice overs*

Several reviewers suggested that we add a naration of the existing text. we are considering this suggestion. A possible scenario would be to narrate the basic discussion of each topic (or module) and in addition to have hyperlinked text with links to more detailed topic coverage.

- *more on www*

All reviewers wanted more, more, more about the internet and the world wide web. I hope the we can remedy this in several ways in future releases. First we should use a web-like search engine to drive the application. This gives users an intuitive look at the web without having to be on the web. The world wide web module will be expanded in the next release. Secondly, I would like to consider adding web software to Infotech Interactive.

- *we are "on target"*

Generally, the reviewers felt that this was a worthwhile collection of learning exercises which targeted the correct population and, when used, added academic value to their course.

Based on this feedback from reviewers and other responses from users, we plan to incorporate these suggestions into a new version of Infotech Interactive to appear later this year.

References

1. A. Q. Baxter
Infotech Interactive
Richard D. Irwin, Inc. 1995

2. **The Human Element**
2100 Sherman Avenue
Suite 105
Cincinnati, OH 45212

3. Williams, Sawyer, and Hutchinson
Using Information Technology
Richard D. Irwin, Inc. 1995